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ABSTRACT

The core issue of this paper is to present the way the different schools of economic thought are approaching the money supply process, the money-income relationship (a restricted quantity theory of money approach) as well as the money multiplier model. More analytically, in the theoretical part of our paper we briefly discuss the arguments between the different post Keynesians school of thought upon these issues (Accommodatonism, Structuralism, Liquidity Preference and Circuit theory of Money) as well as the Orthodox and the New Keynesian school view.Then in the statistical part, with the help of advance econometric causality techniques, we are searching for the theory which better "fits the data" in the G7 economies. The results favor the idea that in most of the G7 economies -with the possible exemption of France and Japan- the "road" of non-orthodox money generation process (with some peculiarities for each country) seems to be followed.

J.E.L. Classification : E51.

Keywords : Money theories, Bivariate (*Lutkepohl and Reimers*) VAR's, Cointegration.

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1.Introduction

The main purpose of this paper is to clarify the idiosygracies that are emerging from the different school of economic thought in explaining the money-income and the money multiplier relationships. A second aim is to implement advance econometric causality techniques upon these relationships for classifying, wherever possible, in a country by country procedure the G7 money generation process.

More analytically, the paper incorporates the following sections: Section 2 briefly discuss the basic differences between the post Keynesians school of thought on money (Accommodatonism, Structuralism, Circuit theory of Money and Liquidity Preference approach) as well as the Orthodox and the New Keynesian views. In Section 3 presents the existing empirical evidence on the money endogeneity issue from the "International experience". In section 4, the variables, the data and the sample that will be used in the empirical part of this paper, are presented. Section 5 justifies the implementation of the selected econometric methodology –the *Lutkepohl and Reimers* (1992) bivariate VAR causality approach- along with a brief discussion on the produced causality results. Finally, in section 6, the concluding comments concerning the nature of money in G7 countries are presented.

2. The theoretical debate regarding money

In the [Post Keynesian] monetary theoretical world, money is an output of the economic system with its behavior governed by the borrowing needs of firms, households and the government as well as the portfolio behavior of financial institutions and of the individuals. In the real world, we face interactions between the main "economic establishments" which are the *monetary authorities*, the *commercial banking industry* and the *households and firms*. These interactions are expressed through the money supply process and consequently affect the direction of causality and stability of the money-income relationship and the money multiplier model (e.g. M*V = P*Q and M = m*H respectively[1]). Moreover, the money interconnection among the three "economic establishments" we mentioned in advance, is producing a

[1] With m = (1+c)/(c+r), in a simplified form, where c = C/D the public desire to hold currency as a proportion of deposits and r = R/D the banks' decision to hold reserves as a proportion of their deposits.

continuous fight for dominance between them and consequently upon the overall economy. In simple words, we tend to believe that this "fight" for dominance in the economy is expressed into the causality implications regarding the *money-income link* and the *multiplier model*.

In theoretical level, the dominant role of monetary authorities (central bank) is better represented through *Monetarism* and partly through New keynesianism. On the other hand, the dominant role of the commercial banking industry, through *New keynesianism,* and the dominant role of households and firms (aggregate demand and its needs) through the four alternative *post-Keynesian* monetary sub-schools of thought. Such diversified analysis is also related to the money endogeneity/ exogeneity issue of the literature. Lets now meet the schools commencing from the post-Keynesians.

2.1. Accommodatonism-(*ex ante*) Horizontialism

The general framework of Accommodatonism-Horizontialism in the money sypply determination process, is analysed in three main relationships. First, the relationship bewteen firms and banks (the demand for credit), second, the relationship bewteen banks and the central bank (the demand for reserves) and third, the relationship bewteen banks and households (the demand for money balances). In each case is the demand which determines supply. Here we are rather focused on the attitude of both commercial and central bank towards the economic agents and the firms in particular, which are considered as the "protagonists" (aggregate demand) of the economy. In other words, Accommodationalism is the response of the financial Institutions and Authorities primarily towards the production needs. These needs are actually borrowing or aggregate demand needs proxied through demand for credit (loans).

Regarding the commercial banks behavior, the "*Loans create Deposits and Deposits makes Reserves* (Lavoie, 1984)" strategy is expected to be followed. In bank's accountancy terms, assets (loans-credit) create deposits (money supply). More specifically, short term demand for bank loans are primarily determined by the working capital financial needs of firms (Moore 1989a, Panagopoulos and Spiliotis 1998) and this is realized by the opening of a bank deposit account. In causality terms,

this implies that bank credit (BC) causes monetary aggregates (M.A. e.g. M1, and M2)[2] [3]. Regarding the interest rates policy, commercial banks follow the strategy of "price setters and quantity takers" [horizontal money supply approach] in both retail lending and deposits markets (Moore, 1998). More specifically, central bank supplies reserves and currency on demand by setting the short term interest rates (e.g. the overnight rates). Commercial banks then set their credit pricing policy in the form of a mark up over the cost of borrowed funds. This mark up is reflecting the Kaleckian degree of monopoly power affected by different proxies of the economic cycle (see Seccareccia, 1996).This strategy defines what is called Horizontialism regarding the pricing of the credit policy[4].

On the other hand, central banks practitioners almost always view themselves as suppliers of reserves on demand and reluctant to deny the commercial banks

[2] As Moore (1998) says "*The money supply at the monetary base thus become perfectly endogenous, determined by the quantity of bank credit demanded, at the interest rate set exogenously by the central bank*".

[3] Moreover, Accommodationists believe that commercial banks exercise a *liability management* policy concerning their balance sheet. Such policy implies economising reserves for lending expansion purposes by convincing the public to give up very liquid assets of sight deposits or even saving deposits and accepting less liquid bank liabilities, such as time deposits and certificates of deposits. However, such policy is implemented irrespective of the non-accommodating behaviour of the central bank (and therefore the need for reserves). It is implemented because required reserves (RR), as Fama (1980) says, operate as "*...a direct tax on the deposits returns since it lowers the return on deposits by the fraction of deposits that must be held as reserves*." So, contrary to the Structuralists, Accommodationists claim that *liability management* is applied *even* in an accommodating environment and is not a matter of reserve shortage by the commercial banks or central bank's interest rate policy. Consequently, in the long run bank credit expansion (BC) –aggregate demand needs- is not linked (actually synchronised and adjusted) to the exogenously imposed changes of the credit multiplier components as these are expressed through the *liability management policy* (so e.g. BC ≠ MIER). A profit maximisation policy on behalf of a commercial bank, in the last two decades falling interest rate world, leads to an autonomous *liability management strategy* aiming for releasing reserves not so much for loan satisfaction purposes but mainly for an active non-loan asset management policy. This will imply that any liquidity ratio term (e.g. loan/reserves) may not change when *liability management policy* is applied.

[4] It is important to clarify here that Horizontialism is not synonymous to Accommodationism. In other words, we may also have Horizontialism -which is reported here as the pricing policy of Accommodationism- inside Structuralism (see Figure 1, in Deriet and Seccareccia, 1996 for a diagrammatic representation of the difference). In the case however of Structuralism, its inclusion is *the result* of a loanable fund policy for reserves by the central bank. In other words central bank uses market forces to reach an interbank rate where it can be for instance adequately profitable to "sell" reserves. On the contrary, in the case of Accommodationism, pricing policy is strictly linked with other central bank's *ex ante* objectives irrelevant to the price of reserves (see Moore 1989a, p.487 for details). In a simplistic form, in the Accommodationism we begin but in Structuralism we can end up with Horizontialism.

reserve needs because this could jeopardize the solvency of the banking system. As Moore (1989, 1989c) and Goodhart (1994) reports, any hesitation in supplying base money on demand is inconsistent with the central bank's lender of last resort function. In addition, central bank's base interest rate is considered as an exogenous variable which is "*exogenously determined with respect to the income generation process. Whether, in particular, liquidity preference, or anything else determines it, is entirely immaterial*" (Pasinetti, 1974). Moreover, it is considered that any change in base interest rate is rather linked with threats of inflationary pressures than any anti-Accommodationalistic central bank attitude. As Nell (2000-1) says, Accommodationists' approach is the exact opposite of the Monetarist approach, where money supply can be viewed as a multiple of the monetary base and that base is exogenously determined by central banks. As Moore (1989a) clarifies: "*If banks need more reserves* (for credit expansion) *they will borrow them, at a price administrated by the central bank.*" In empirical terms, Accommodationalist argument implies that total bank credit (BC) causes monetary base (MB).

Generalizing, Accommodatonism is a monetary theory where aggregate demand is the driving force of the economy and the financial institutions (central and commercial banks) behave as a kind of servers. So in terms of the money-income link –and in line with Circuit theory of money- the economy is rather expected to move (or "run") from the right to the left. This argument was advocated by Kaldor & Trevithick (1981) when they claimed that changes in money supply are a result and not a cause of changes in money income, and vary in relation to prices and output. Nevertheless, other economists were more cautious and they accepted a feedback relationship among the two variables. More analytically, Moore (1989a) on this issue comments that : "*Two-way causality is therefore a more accurate characterization for money-income*"[5]. On the same line Pieway (2000) claims that "*Monetary change both causes and is caused by, income change*".

[5] We believe that the Moore's (1989a) idea of "two-way causality" between money and income has been also influenced by the problem which Davidson (1978) actually created through his *income-generating process* argument. More specifically, for Davidson the causality goes from planned increases in expenditures (Y^e) to increaces in current money supply (M) to realised income changes (i.e. $Y^e \rightarrow M \rightarrow Y$). However in a bivariate *money-income* causality test, without a led expectations variable included, it is rather difficult to

2.2. Structuralism

Structuralism holds its roots back to the Minskyian (1957a,b) tradition. In this post keynesian approach, although economic agents and firms play the important role in the economic system, central bank (and auxiliary the commercial banks) is a significant player and has the privilege to accommodate reserve needs or not. This view implies the abandonment of passive accommodation [horizontal credit supply function and horizontialism] and the adaptation of resistance on credit expansion. This could lead to an upward sloping money supply curve (Spiliotis, 1992, Palley, 1996). Moreover, the classical view regarding the direction of the money–income relationship - from the left to the right - is not challenged by the Structuralists. What is actually challenged is the stability[6] of the quantity theory of money and in particular the stability of the multiplier itself (m or Mier) at/and the multiplier model. This multiplier's stability question has some consequences on the money–income relationship[7] that should be seek to the behavior of the financial institutions (central and commercial banks).

Commencing from the central bank, which is the source of non-accommodatonism that leads to Structuralism, the lack of accommodation policy is imposed upon the commercial banks reserve needs for loan demand satisfaction. It means that central bank will basically try to restrict the growth of non-borrowed reserves, NBOR, (through a contractionary open market operation policy) since it can control monetary base (its liabilities). The effectiveness of central bank non-accommodative policy (on reserves) will be secured if the cost of borrowing from the discount window is such that is discouraging for the commercial banks[8] (BOR). The outcome will be a partial accommodation of the demand for reserves accomplished by an increased interest rate in the process[9]. As Palley (1996) says, a central bank

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discriminate a *Post keynesian* from a *Monetarist* result only by intentions.

[6] With the term *stability* we actually refered to a clear causality direction for both money-income and multiplier's relationships, among the examined variables, and no other result (e.g. feedback or no relationship).

[7] Nell (2000-1) and Shanmugam, Nair and Wee Li (2003) report that *Structuralists are in favour of* a *feedback* relationship between nominal income and M.A.s (e.g. M3).

[8] The effectiveness of such policy will implies that discount window borrowing will not be a close substitute for non-borrowed reserves (Pollin, 1991). In empirical terms, this will imply that Pollin's idea of "Substitutability" could be tested (e.g. BOR =a + β*NBOR).

[9] For the Structuralists -in contrast to the Accommodationists- the prime targeting variable is the base and not the interest rate.

discretionary policy of raising federal funds rate by restricting discount window borrowing or draining non-borrowed reserves, can "produce" an upward sloping reserve supply curve in the federal funds market[10]. This could result in a less than a full accommodation of loans' demand. In statistical terms, this will imply that monetary base (MB) could cause bank credit (BC).

The question of multiplier stability (m or Mier) we mentioned in advance is actually a question directly related to the commercial banks behavior. Although the initial idea of "*Loans create Deposits and Deposits makes Reserves*" is not denied here -credit is always demand driven- the non accommodative policy raises the question regarding the availability of reserves demanded by the banks. This question of "availability" can be confronted through liability management policy[11]. However according to the Structuralists (see Pollin, 1996), such "liability management (policy) will not necessarily create an adequate supply of reserves to meet demand (for reserves)" and therefore the growth of liability management is inevitable to rise the rate of interest within a given financial structure[12]. The final quantitative consequence of such commercial banks policy is that the components of the money multiplier (m) are affected[13].

In empirical terms, *Structuralism* could be accepted when total bank credit (BC) is in a feedback relation with the monetary base (MB) as well as with the money multiplier (m or Mier). This empirical suggestion comes from Nell's (2000-1, p.316) argument that Structuralism theoretically is a mixed model of Monetarism and Accommodationism. More analytically, increased bank credit (BC) causes monetary base (MB) because *"Loans create Deposits and Deposits makes Reserves"*. In

[10] Through this central bank non-accommodating behaviour Structuralists reinstate to some extent the loanable fund theory for reserves in a post keynesian environment.

[11] Pollin (1996) by applying unit root tests regarding the Loan/Reserve ratio raised the question of "Proportionality" in order to clarify weather money follows *Horizontialism* or *Structuralism* in any examined economy. Stationarity of the ratio will imply that *Horizontialism* prevails. However counter-argument exists, on behalf of *Horizontialism,* from the moment commercial banks *liability management* policy was disconnected from the non-accommodating policy environment.

[12] As Pollin (1996) says "*The reward of higher interest yield will be necessary to induce asset-holders to shift their holdings into less liquid forms*."

[13] See Pollin (1996,p. 498) argument where it is mentioned that *liability management* policy on behalf of the intermediaries (e.g. commercial banks) is engaged after the restriction on central bank non-borrowed reserves (NBOR). Such policy will produce changes in the components of the multiplier and an upward shift on interest rates.

addition, as we mention in advance, central bank can restraint (affect) reserves availability and therefore the reverse causality holds as well. Supplementary, the increased bank credit (BC) engages liability management policy which leads to multiplier changes (alters the currency/deposit and reserve/deposit ratios). Simultaneously, as Nell (2000-1) say, the Orthodox side of the *Structuralism* will imply that central bank, through its multiplier affection, will be in the position to affect banks credit expansion (BC)[14]. Regarding the money-income relationship, two thinks has to be remembered: first, as we mentioned in the beginning of the section, no revolutionary challenge on the direction of causality has been reported and second the Nell's (2000-1, p.316) argument that Structuralism theoretically is a mixed model of Monetarism and Accommodationism. Although never directly written, the endogeneity of money generation process (aggregate demand needs) from the one side and the partial ability of the central bank to control the quantity of comercial banks' liabilities (Palley, 1996a) from the other side, has driven many economists to consider *feedback* (GDP⇔M.A.) as the representative view of the *Structuralism*.

2.3. Liquidity Preference[15] (L.P.)

In this post keynesian approach we move away from the accommodating/non-accommodating dilemma of central bank regarding the commercial bank loans. As in the case of Structuralism, what is actually challenged here is basically the stability of the multiplier itself (m or Mier) at/and the multiplier model. In this approach, the problems for the bank credit expansion (and satisfaction of aggregate loan demand needs of agents and firms) are primarily raised by the role and the behavior of households/agents (their deposits which is accounted in the liability side of the banks) in connection with commercial banks' respond through their asset management policies.

Actually, what has now been "introduced" in this analysis is the existence of an independent demand for money with its consequences for bank lending as well as

[14] As we mentioned, the multiplier's (m) instability or bi-directional causality is to some extent reinforcing the *income – money* feedback relationship advocated by the Structuralists. On the other hand, this instability contributes nothing to the Accommodationists' approach on the direction of the *income – money* causality.

[15] This section could be also called as *Structuralism* beyond the central bank's accommodation dilemma.

for the interest rate determination. So although the idea that *"Loans create Deposits and Deposits makes Reserves"* is not denied, the L.P. theorists do not accept the Moore and Kaldor & Trevithick argument that money cannot be "in excess". As Howells (1995) puts it: "*what reconciles the deposits resulting from this lending with people's willingness to hold money*?" and supplements : "*what is it that ensures that the supply of new deposits created by the flow of new net lending is just equal to the quantity demanded?"*

So simultaneously with this "mismatch" issue, Howells actually argues that implicitly the solution here is the reconciliation mechanism which ensures that the supply of new deposits created by the flow of net lending is just equal to the quantity demanded[16]. Reestablishing the existence of an "active" independent demand for money- through L.P.- he said that an excessive (or rather undesirable) new bank deposits will turn[17] its holders to bonds[18] and, as a consequence, bond yields will fall. Therefore, the yield spread with deposits will narrow. This is a first step that creates a reduction of the undesirable excess deposits. The second step –which seems to eliminate any remaining "excessiveness"- is that the fall in bond's yield is not only relative to money rates but to the other financial assets yields too. So, providing that nonmoney assets (e.g. corporate bonds) are at least partial substitutes of bank lending, as a mean of firm finance[19], we will have the narrowing of the yield spread between bank lending and non bank lending (due to the falling cost of non bank finance). This way a restriction of bank lending can be produced. The entire argument regarding these interest rates (or spreads) differentials, according to Howells (1995), provide us with the mechanism for the elimination of any undesirable new bank deposits[20].

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[16] Apart from Howells' solution to this "mismatch", other solutions are available: For instance, the Moore "convenience lending" view, or the Kaldor and Threvithic's reflux view. However, we analyse the Arestis & Howell's solution here because it is the main L.P. reply on this "mismatch" question.

[17] Implying substitutability between money (deposits) and other financial assets (e.g. bonds).

[18] This can be engaged not only by the firms and households but, as Robinson (1956) says, even by the commercial banks for collecting the different between deposit rate and bond yield as profits. Today this can be considered as *asset management* for the benefit of the commercial banks.

[19] Or even the repayment of older bank lending by the firms (see the Kaldorian reflux approach).

[20] Lavoie (1999), on the other hand, considers the interest rates (or spreads) differentials as "perfectly reasonable and technically correct" mechanism but "a second-order effect" after convenience lending and the reflux mechanism have played their role. He also supplements

In causality terms, the liquidity preference view implies a bi-directional causality between total bank credit (BC) and monetary aggregates (M.A.). Analytically, in the first case the causality that BC causes M.A. is based on the assumption that money is endogenously determined. The reverse assumption (that M.A. causes BC) is based on the theory of an "*effective amount of deposits held*"[21], representing the existence of an independent demand for money. Moreover, the above mechanism has an endogenous –and not an administrated - "flavor" regarding the interest rate determination process which is produced by the supply side role of agents/firms and households through the financial system. The entire L.P. two steps reconciliation methodology challenges the stability of the credit multiplier and is expected to produce feedback effects between itself (m or Mier) and bank credit (BC)[22].

Regarding now the central bank behavior, we can accept Dow and Dow (1989, pp. 151-7) argument which –in line with the above approach- says that L.P. can operate to limit accommodation of the demand for credit and affect the level of interest rates on loans, quite apart from any influence of the central bank. If this is the case, contrary to the *Structuralists* approach, we should not expect any long run relationship between bank credit (BC) and monetary base (MB)[23].

Finally, the relationship between money income (GDP) and the "effective amount of deposits held", in the form of monetary aggregates (e.g. M1, M2), is not particularly addressed by the school representatives. However, two points have to be underlined here: firstly that, like the other post keynesians, they accept that loans are demand-driven and therefore we can infer that they partially recognize the "*income causes (or precedes) money*" process. Secondly, as in Howells (1997, pp. 433) reconciliation problem puts it, when people have particular preferences in holding

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that, it (the mechanism) can be considered as "variant of the reflux mechanism, where asset yields play a role."

[21] In other words, the supply of deposits created by the new bank lending need not be willingly held by new deposits owners, who have an independent liquidity preference view about the money they wish to hold. The idea is that, in contrast to the *Accomodationalists* view, an adjusted supply of deposits ("*effective amount of deposits held*") will represent a mechanism were without the central bank intervention we will have its classical constraining implications upon loans ("*deposits cause loans*" side).

[22] See also Nell (2000-1, pp.314) on the causality issue.

[23] *Liquidity Preference's view* to some extent is reformulating the "*Loans create Deposits and Deposits makes Reserves*" motto to "*Loans create Deposits and Deposits makes loans and*

wealth (deposits), this "*causes them* (people) *to rearrange their portfolios with consequences for prices, output, interest rates, and so on.*" This is crucial statement because it can provide us with an explanation for the reverse causality. On aggregate, we can reach the conclusion that, at least in the long run, a feedback relationship between the monetary aggregates (M.A.) and money income (GDP) could be supported[24].

2.4. Circuit theory of money (C.T.M.) [25]

In contrast to the other post keynesian monetary theories, "*Money is not endogenous because of the role of the central banks* (an Accommodatonism–Structuralism debate) *or as a result of household portfolio decisions* (L.P. issue)" (Rochon 1999). In this approach assets (e.g. credit -as a proxy of the aggregate demand forces) creates money (liabilities) and not the other way round. Moreover, its revolutionary view is extended to the *money–income* and to the multiplier model relationships. More analytically, C.T.M. accepts that the former relationship runs from *the right to the left* and the latter (runs) from *the left to the right* (Rochon 1999a). In other words, households and firms credit needs triggers the other two institutional establishments.

For Circuitism money is primarily a flow variable and not a stock one, although it manifest itself as a stock at the very end of the monetary circuit. Moreover, it is the result of the complexity and the links between three specific causal relationships: Banks and firms, firms and workers and banks and households. The first one is responsible for the creation, the second for the circulation and the third for the destruction of money.

Starting from the crucial relationship between banks and firms, finance -in the sense of new credit (BC)- is needed because firms' costs proceeds the receipt

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all this is irrelevant to Reserves".

[24] To some extend, on the issue of money-income relationship, L.P. school looks like what latter we present as "moderate" New Keynesianism. Their similarity is produced because they both undermine the importance of central bank in the all money generation process. However, in an extreme level, someone could claim that L.P. school with the withdrawal of the central bank role from the money generation process is unconsciously the school which "opens the gate" for the destruction (not the instability) of money multipliers and consequently the money-income relationship.

(income) of its perspective sales. So credit necessity commences from the credit needs of newly established businesses and/or from keeping the existing businesses going on since firms pay for working capital needs other elements of production cost[26]. Moreover commercial banks, as a profit maximizer in a world of uncertainty, have their on L.P. which "arises at the beginning of the circuit" (Rochon, 1999). If they are optimistic for the firms' future, their L.P. diminishes and their active role will be to "give birth" to loan supply in order to meet not the entire "demand for credit" but the "creditworthy demand for credit[27]". So basically credit is created ex nihilo in order to satisfy specific production plans and is not constrained from scarcity restrictions. This is basically the way the creation of money -which is the first part of the circuit approach- is formulated.

The second stage of the circuit approach is the relationship between firms and workers, which leads to the circulation of money. As Rochon (1999a) says, once credit money is secured funds are distributed to "workers and rentiers". If the payment, through the new credit line, of money to workers (and therefore to households) will not occur, money will not circulate and the circuit will not exist. In this part of the theory emphasis is also given to the creation of the purchasing power of the workers (or households' consumption) since firms must be able to recoup money from the sales of output to them. The outcome of this is the realization of households' money income (GDP of households) and operates as an introduction to the third stage as well.

The third stage of this approach is the relationship between banks and households and it is linked with the final part of the circuit theory, which is the destruction of money. More specifically, households' consumption -product of workers' money income- is actually firms' income (GDP of firms), in order to repay their loans. If this households' consumption is high enough then firms' income will be

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[25] Fontana (2004) makes an interesting attempt of incorporating the components of this monetary theory into the classical *Accommodatonism–Structuralism* debate. We however, prefer to treat it as a different school here.

[26] The financing of all the above elements is considered as prerequisite for the production process, which with its turn is influenced basically by the existing effective demand and secondary by its expectations.

[27] Using *creditworthy* criteria like firm's management, past relationship with the bank, collateral and key financial ratios (e.g. cash flows, debt to equity ratio etc.). Such qualitative criteria can influence the supply of loans.

sufficiently high to repay its credit, which implies that the cycle of credit closes and money "is destroyed"-deposits are deleted from the commercial bank liabilities. Such evolution allows firms to ask for new credit, after the repayments to banks.

Note that, apart from private consumption, firms can also get money from household's savings (deposits) by selling back to them their securities[28]. But firms' ability to absorb households savings will actually depend in the yield spread between long term interest rates (financial securities performance proxy) and the short term interest rates (savers' account performance proxy). In other words, firms will accept more credit from households provided that long term interest rates (or financial securities yields e.g. corporate bonds) are high enough to balance households' liquidity preference (or savers' account performance). So household's savings are partly allocated directly as financial securities to firms and partly are hoarded[29] –thus determining household's liquidity preference and therefore their money demand (not credit demand)30. In general terms, in the circuit theory of money we start with credit demand we pass to the income realization and we end up with joint money demand of firms and households (which determines money stock- e.g. M.A.'s)[31].

Consequently, any short term interest rate changes can affect the stock (ending) and not the flow of money (credit). Flow can seriously be affected if the demand for credit, derived from the real economy's expectations, is declining. Only then commercial banks, by basically reconsidering the creditworthy criteria, alter the new credit creation with the known consequences at the end of the day upon the stock of money. Therefore under this reasoning of "the cycle", the demand for bank credit is rather expected to affect the multiplier's components and not vise versa (e.g. BC $\Rightarrow$ Mier and BC $\Rightarrow$ M.A).

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[28] This however is not new money in the market since it has already been *created* in the system and now is simply reallocated.

[29] Rochon (1999) names these two categories as *financial* and *hoarded* savings respectively.

[30] This argument has some similarities with Howells (1995) *reconciliation mechanism*. However, since we are in a cyclist approach (C.T.M.) in this case we …end up with money demand expressed through the households' *liquidity preference* (the deposits). L.P. does not intervene restrictively on the loan creation and accommodation. Alternatively, it looks like depositors' attempt to provide alternatively or supplementary flows whereas Howells' argument was developed in order to restrain or to alter bank borrowing.

[31] To advocate upon this view, Parguez and Seccareccia (2000) speak about *"…the distinction between the demand for loans and the keynesian demand for money, the latter of which is merely the demand for liquid balances emerging ex post out of the credit money previously issued to finance loans.*"

In addition, "*the prime role of the central bank is to act as a clearing house thereby, allowing banks to clear their debts – a role that is closely linked to the role of the lender of last resort. On daily basis, the central bank actively intervenes in the monetary and financial markets to assure that all debts are finally settled* " (Rochon and Rossi, 2004). Moreover, central bank base interest rates are based on its other economic[32] and non-economic objectives. All other rates are in line with these rates, with a mark up logic influenced by the creditworthiness of the borrowers[33]. So we have an exogenous (to the loanable fund theory) base interest rate determination that is nevertheless a secondary issue for *Circuitisists*[34].

Finally, in causality terms the three stages of circuitism could be translated as "a step backwards" Accommodatonism-Horizontialism. Analytically speaking, we can speak for a two-stage causality procedure where bank credit (BC) expansion causes (or precedes) income (GDP) expansion and this consequently causes monetary aggregate changes (MA- third stage)35. So by applying this approach we can econometrically distinguish monetary Circutism from Accommodatonism-Horizontialism, which will appear if we simply assume a bivariate relationship between monetary aggregate and output.

2.5. Monetarism

We are departing now from the heterodox monetary theories and we move to the orthodox views. Friedman and the other monetarists, believed that exogenous increases in the money supply via open market operations may not only operate via the traditional Keynes interest rate mechanism on the marginal efficiency of capital, but it will also lead agents to increase, *pari passu*, the demand for producible household durables. This alleged increased demand for consumer durables is held to be due to (i) a real balance or wealth effect and/or (ii) a portfolio balance effect (Davidson, 1978, ch. 9, p. 227-8). The latter effect, it is claimed, is a result of agents

[32] For instance, a central bank persistence to an anti-inflationary policy.
[33] This "creditworthiness" is double sided issue since a borrower failure to reimburse its loan it produces a commercial bank's problem of credibility in the interbank market through the "writing off" account of its income statement.
[34] Moreover, this central bank exogenous interest rates determination is also influencing the term structure of interest rates (Rochon 1999) .
[35] Consequently, if the two stage causality sequence is valid we should not deny the indirect causality link between BC and M.A. (e.g. BC $\Rightarrow$ M.A.)

economic decision finding that the proportion of the portfolio that they hold as money is excessive, and therefore they display an infinite (very high) elasticity of substitution between money and reproducible durables as components of their portfolio. As Friedman and Schwartz explain "… *money is a stock in a portfolio of assets of financial assets, or houses, buildings, inventories, people or skills. It yields a flow of services as do these other assets; it is also subject to increase or decrease through inflows and outflows, as are the other assets. It is because our thinking has increasingly moved in this direction that it has become natural for us to regard the rate of change in the stock of money as comparable to income flows and to regard changes in the rate of change as a generating force in producing cyclical fluctuations in economic activity.*" (Friedman and Schwartz, 1963, p. 62-3). In simple words, according to monetarists, any exogenous money supply increase can produce, but only in the short run, an ouput effect[36] (e.g. M.A. $\Rightarrow$ GDP and M.A. $\neq$ Real GDP).

Central bank is the dominant player of the financial system (in the sense of setting and fulfilling targets inside the economic system) and operates as the fine tuner of the economy. Its role is determined by Friedman (1968) statement when he argued that : " ... *the monetary authority should guide itself by magnitudes that it can control ... Of the various alternative magnitudes that it can control, the most appealing guides for policy are exchange rates, the price level as defined by some index, and the quantity of a monetary total - currency plus adjusted demand deposits, or this total plus commercial bank time deposits, or a still broader total.*" (p.14-5). This last statement can be translated to that any significant change in the money supply - the liabilities of the commercial banks e.g. M.A.'s - is not finally imposed by simply the needs of the agents and/or firms of the economy (the market forces) but rather by the approval and perception of priorities of the central bank. Therefore money supply expansion could be considered as more exogenous than endogenous to the economy's aggregate demand priorities. In statistical terms, any kind of money exogeneity will imply that the different broad monetary aggregates, M.A., "are caused by" and therefore restricted, when necessary, by monetary base (MB).

[36] Friedman, presenting the monetarist' view, also stated that: "*changes in the quantity of money as such in the long run have a negligible effect on real income so that non-monetary forces are 'all that matter' for changes in real income over decades and money 'does not matter' ... I regard the description as money is all that matters for changes in nominal income and for short - run changes in real income.*" (Friedman, 1974, p. 27).

For instance, central bank could restrict money supply (M.A.'s) by direct and/or indirect control on the quantity of reserves –by changing the amount of commercial bank's reserves in the central bank's liabilities. As a consequence of the approach, the credit demand "satisfaction" (BC) should be considered to be under the "approval" of money growth (M.A.) and not the reverse. So credit is an endogenous reaction of an exogenous shift of money growth, as this is initiated through the monetary base (MB)[37]. Regarding the role of money multiplier (m), Meltzer (1995, p. 63) reports that "*Monetarist analysis shows that each of the different money stocks is the product of the monetary base and a money multiplier.*" Furthermore on this issue, De Long (2000) remind us that Friedman and Schwartz (1963) and Cagan (1965) reported that changes in the money supply are often driven by changes in the deposit-currency and deposit-reserve ratios as by changes in the monetary base. In other words, by changes in the money multiplier and/or monetary base (e.g. Mier $\Rightarrow$ M.A.).

In overall, the Monetarist methodology seems to enlarge the central bank role and if not to neglect at least to diminish the role and the importance of the financial institutions (e.g. commercial banks) in the evolution of the economic system. This "credit channel" atrophy, inside the orthodox framework, was basically reinstated and highlighted by the New Keynesians.

[37] In simplified causality terms : M.B. $\Rightarrow$ M.A. $\Rightarrow$ BC.

2.6. New Keynesianism

New Keynesianism money theory is rather operating supplementary to the Orthodox "money channel" and not counter to it.[38] As we said in advance, is dealing with the development of "credit channel" focusing primarily on commercial banks' asset management and the substitutability between its elements[39]. So the endogeneity or exogeneity of reserves is not its main issue. The manipulation of the loan supply through the banks' asset management, is the point for an extensive analysis. In contrast to the post keynesians, the aggregate loan demand, which actually is the expression of the agents/firms' needs, is not underlined so much.[40] For their critics however, by neglecting that is similar to neglect the money generation process in the economy.

For the new Keynesians, the importance "credit channel" is a supply driven one. This supply driven approach is described better through the way an increased loan rate operates upon the firms of the economy (product of a money supply shock e.g. an increased federal fun rate). More analytically, following Bernanke and Gertler (1995) approach, "*monetary policy affects not only the general level of interest rates, but also the size of the external finance premium*." For the two authors this *premium* is the multiplicate recorded "*effect"* product of the monetary shock upon firms' financial position with a reflection of the commercial bank lending behavior too. This new channel –the credit one- is present by the new Keynesians for explaining better the variations in the real economy. This "channel" is implemented primarily through the *Lending* channel of the commercial banks but in link with the *Balance sheet* channel of the firms.

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[38] As Rochon (1999) says "*..New Keynesian theory is neither new, nor so Keynesian*". On the same line Delong (2000) question himself *"..that perhaps New Keynesian economics is misnamed."* and next supplements .. *"why then do we* (the economists) *talk much more about the "New Keynesian" economists than about the "New Monetarist" economists?"*.

[39] The rules of *Basle II* – which are dealing with commercial bank asset management and capital adequacy- could also be classified into the *New Keynesian* macro framework. Alternatively, restrictive rules on commercial bank's asset management policies and capital adequacy could be translated as Monetarism regarding the asset side of the commercial banks or *New Keynesianism*.

[40] As Gordon (1990, p. 1117) mention "*The entire demand side of the economy is omitted [in the New Keynesian economics]…Topics on the demand side can be omitted simply because they are not at the heart of the conflict between new-Keynesian and the new Classical macroeconomics*."

Commencing from the *Balance sheet* channel, any central bank interest rate shock (say increase of federal fund rates) will spillover in the loan rate affecting in a direct and an indirect way the financial potion of the firms and consequently the determination of the external finance premium. As Bernanke and Gertler (1995) reports, the direct way which weakens the borrower's financial position operates through the burden which increased interest rates creates to the firm's net cash flow (increased debt repayment) as well as through to the downward revised firms assets prices. Both these effects are reducing the companies' creditworthiness upgrading the level of the external finance premium. The indirect way which financial potion of the firms is affected by the supply-initiated loan rate increase is through the reduction of consumers spending. This implies that the firm's revenues are expected to decline producing an eroding effect on its net worth and creditworthiness over time. This process creates again an increase on the level of the external finance premium. Both effects are assumed that they have further negative implication in the investment and consequently production (output) process.

The *Lending* channel on the other hand originates to the Bernanke and Blinder's (1988) views. More analytically, open market sales[41] by the Fed, drains reserves and deposits from the banking system. This is expected to limit the supply of bank loans by reducing commercial bank's access to loanable funds[42]. So, provided that loans and securities are not perfect substitutes in the bank's portfolios, all commercial banks will not be in a position to replace easily lost deposits with other sources of funds, like certificates of deposits (CD's). The reason is simple: small and poorly capitalized banks typically cannot issue large CD's or they have to pay high interest rates for these[43] [44]. The general message is obvious : since other forms of credit satisfaction of firms are not perfect substitutes for bank loans, the loan supply

[41] This policy can be the alternative to the federal fund rates shock we described in the *Balance sheet* channel approach.

[42] This argument is *contra to* the post-keynesian revolutionary approach that idea of loanable demand and supply function does not intervene in the loan creation and accommodation process. As Seccareccia and Parguez (2000) say loan is created *ex nihilo*.

[43] As Bernanke and Gertler (1995) say *"..CD interest rates increase by significantly more than the T-bill rate during a monetary tightening, (is) consistent with our claim that the demand for bank's management liabilities is not perfectly elastic."*

[44] Moreover, any strong base interest rate upward shock leads to a downgrading of commercial banks financial assets valuation. So the overall situation for small commercial banks is getting even worse for considering the possibility of issuing certificates of deposits

curve will be shifted inwards. This will lead to a raising external finance premium and consequently will squeeze the bank dependent borrowers, which, with their turn, will reduce investments and production (output). Therefore the loan *supply* channel is the dominant figure which is expected to affect investment and consequently output (e.g. $BC^{\text{supply-driven}} \Rightarrow GDP$)[45].

Concerning the central bank's "money channel", the new Keynesians recognize that it is important because the "credit channel" creation and enlargement originates, as a kind of reaction function, to the Fed policy (especially the unexpected shocks). Regarding now the issue of the "money channel" effect on output, most of the prominent economists of the school are standing irresolute between two views. That either, there is long run link between money and output, initiated by the monetary aggregate, or that we have a weakening or even breaking link among the two variables in favor of the interest rates explanatory role for output. For instance, Feldstein and Stock (1994) advocating for the first view in US economy, they support that "*..the Federal reserve could control quarterly M2 growth completely by extending reserve requirements to all of the components of M2.*" In addition they believe that by controlling and adjusting M2 we can restrict the GDP volatility[46]. Friedman and Kuttner (1992) on the other hand, seek the explanation of US future nominal income path, in a VAR approach *versus* monetary aggregates (like MB, M1, M2 and credit) as well as *versus* interest rates (like Treasury bills, Commercial papers and their spread). Their conclusion was that, regardless to the method of estimation, the selected time period affects the produced result. In other words, the pre-80's explanatory power of monetary aggregates is loosing ground as the sample time period is extended to the 90's. It is the spread between Treasury bills and Commercial papers who carry the explanatory role, according to the authors. In simple words, future nominal (and mainly real) output in nowadays is mainly determined by the different specification of interest rate' spreads and secondary by different specification of deposits (monetary aggregates). Bernanke and Blinder (1992, p.904),

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(CD's).

[45] In the New Keynesian literature, the way this channel appears to operate upon output is more highlighted through money or interest rates (or interest rate' spreads) shocks, engineered by the central bank's actions, than directly through a quantitative bank credit variable.

[46] This view deviates from the Monetarists' "money channel" origin which they advocate in favour of a constant growth regarding the selected for policy monetary aggregate.

on the other hand, do not stand in the middle of the river : "*…money has far less predictive power for output than do interest rates* [and this] *is an important challenge to the traditional "money leads income" argument for monetary policy effectiveness.*" For the authors, it is the federal fund rates which perform better than monetary aggregates, treasury bills and bond rates in forecasting real variables (real output decompositions). Finally, Hufer and Kuttan (1997) suggest that the question of the money (M1 & M2)–(real) output long run relationship in USA apart from the sensitivity of time period selection is also affected by the type of stationarity imposed on the data (trend or difference one). [47]

Finally on the issue of multiplier's role an interesting point has been made by Palley (1994, p. 82). Although not specified as New Keynesian, he presented it as an orthodox causality view where money multiplier (m or Mier) causes bank credit (BC). Such causality could be attributed to an New keynesian methodology where a bank respond to a increasing monetary policy shock with be a restricted portfolio recomposition of liabilities due to imperfect liability management (in line with Bernanke and Gertler (1995) argument). This supply originated shock will consequently produce some long run restrictions in bank loans (e.g. Mier $\Rightarrow$ B.C.).

In Appendix 1 we summarize all the alternative money theories concerning the money multipliers and the money-output link. We next move to the presentation of the empirical evidence regarding the money multipler effect on the G7 economies as well on some other countries.

[47] Note that, behind this disagreements upon the *effectiveness* of "money channel" variables for explaining output is actually hiding a "dispute", inside the two orthodox schools, regarding their prime explanatory role relative to the "credit channel" variables. In simple words, for more than two decades the loosening in the US (and the rest of the developed economies) monetary policy and the enlargement of the financial sector has actually shifted the policy variables inside the orthodox school from monetary aggregates to interest rate spreads in particular. In other words, from central bank controlled variables to commercial banks policy instruments. So, in causality terms, the "hard-liners" will insist that directly (through monetary aggregates and reserves) or indirectly (through federal fund rates), central bank will effect output. On the other hand, the "moderates" will say that, apart from the spreads, monetary aggregates may or may not affect output. (e.g. MA $\Rightarrow$ or $\neq$ GNP). This "dispute" is expected to have analogous consequences concerning the MB and M.A. long run relationships [e.g. optional MB $\Rightarrow$ MA].

3. Some International empirical evidence upon the "multiplier effect" issue[48]

3.1. The G7 experience

Regarding the international literature the most characteristic G7 example of testing endogeneity through causality is the case of Howells and Houssein (1998). In that case the causal relationship between bank lending (BL) and M3 was tested for the G7 countries. Their ECM outcome they produced showed that bank lending (BL) causes M3 in France, Italy, Japan, UK and US. This was considered as a strong indication for accepting money endogeneity especially in those countries. However, they supplement that "*our results seem to suggest that the ability of the demand for loans to cause deposits is constrained by the demand for those deposits.*" This is an indication to accept a strong flavor of liquidity preference view in their inferences.

3.2. Other countries empirical evidence on the mulltiplier effect

Other individual (by country) examlpes are those of Nell (2000-1), Vera (2001) and Shanmugam, Nair and Li (2003). Nell (2000-1), on the other hand, tested money endogeneity for South Africa (S.A.) by representing Accommodatonism, Structuralism and the Liquidity Preference view in the way Moore (1989b), Palley (1994) and Howells and Houssein (1998), did it respectively. His outcome was that loans cause deposits in S.A. and so endogeneity was verified. Moreover, apart of the clear endogeneity of money, evidence for Liquidity Preference exists in both his examined periods (1966-979 and 1980-1997). In the first subperiod, elements compatible with Accommodatonism and Structuralism were also present. In the second subperiod, Accommodatonism has still some explanatory power. Shanmugam, Nair and Li (2003), apply the same procedure for Malaysia. Their results were that Liquidity Preference view could be supported without however excluding Accommodationalistic influences.

Finally, Vera tested money endogeneity theory for Spain. He was actually tested the causality direction between bank lending (BL) monetary base (MB) and

[48] We are not presenting the international (and US in particular) empirical results of the literature upon the money-income link since, to some extent, we have already done that especially during the New-Keynesian analysis. Further discussion on the money-income relationship can be sought in Stock & Watson (1989) and Swanson (1998) for the U.S. as well as in Krol & Ohanian (1990), Hayo (1998), and Hafer & Kutan (1999) for some multi-country causality approaches.

money Supply (MS). The verdict was that Bank lending causes MS, which causes MB. This result was in favor of the money endogeneity assumption. Vera considers his results as compatible with both Accommodatonism and Structuralism. So, for clarifying the issue, he actually tried to implement the Pollin's "*Proportionality*" idea on liability management behavior as well as to test the variability of mark ups between prime lending and interbank rate. Unfortunately the results did not indicate any clear cut for favoring one of the two approaches.

Moving now to the presentation of the empirical part of our study we will first present the data and the variables which will be used in the causality analysis.

4. The data

Our causality analysis covers the relationships that are presented in Appendix 1. The data used are quarterly but the examined period varies. Analytically speaking, for all G7 countries the commencing year is 1980(1). However the ending year alters and depends from the data availability provided by the *IMF statistics*. So for Germany and Italy is ending at 1998 (this is related with their Monetary Aggregate data and therefore their entrance at the Euro mechanism). For the rest of the countries we end up at the year 2003 (with the exception of US which ends at 2002). Finally, the variables to be implemented are: the gross domestic product in its nominal expression (*GDP*), the monetary base, *(MB*), the narrow and broad money aggregates (*M1and M2*)[49], the total bank credit *(BC)* and the money multipliers *(MIER1=M1/MB, and MIER2=M2/MB).* All variables are expressed in logarithms (e.g. *LMB, LM1, LM2, LMIER1, LBC*).

[49] For the UK and Italy however the monetary aggregates are restricted to M4 and M2 respectively.

5. Econometric methodology and empirical results

5.1. Methodology

There different econometric "footpaths" someone can implement regarding causality techniques (from simple *E.C.* Models to *Auto Regressive Distributed Lag* procedures). Our empirical procedure was based on *Lutkepohl and Reimers* (1992) methodological approach of causality[50]. The reason (and the advantage) for this specific EC.VAR methodological selection is simple: It is not require an *ex ante* implementation of the unit root tests on the incorporated variables. In other words, it allows the implication of the Granger-causality approach without the pre-determination of the degree of the variables integration (e.g. whether they are I (0), I(1) or I(2))[51]. This is quite helpful since disagreements sometimes exist between the different unit root test, on weather a variable is I (0) or I(1) for example. More analytically, this kind of causality follows the principles of co-integration in bivariate VAR systems, in a step by step basis. This methodology was also used in other empirical papers (see Alexakis, Panagopoulos, Spiliotis (2000)).

One crucial point on this methodology is that if the number of cointegrating vectors between the two examined variables are 1 or 0 (r=1or 0), the EC.VAR's are implemented at their first differences. If, on the other hand, the number of cointegrating vectors are two (r=2) the EC.VAR's are implemented at the levels. Another crucial point for all the bivariate VAR causality tests applied here (as well as for the Johansen's results), is the lag length selection procedure which has been implemented. It is now widely accepted that the causality results are very sensitive to the lag length VAR specification (see Karfakis, 2004). For that reason we have decided to apply five (5) different lag length selection criteria[52] for VARs in all our estimated causalities (see Appendix 1). It is important to mention that in many cases the five tests disagree about the optimal lag length (*k* in tables 1a-1f)). Then we choose sub optimal lag length following the majority of the criteria's decision and

[50] A brief presentation of the method is given at Appendix 2.
[51] However unit root test (*Augmented D.F.* as well as *Phillips–Perron*) have been implemented and are available upon request.
[52] These are: the sequential modified LR test statistic (*LR*), the Final prediction error test (*FPE*), the Akaike information criterion (*AIC*), the Schwarz information criterion (*SC*), the Hannan-Quinn information criterion (*HQ*).

provided that the selected one had no normality problems (*Cholesky* normality test for VAR's implemented).[53]

5.2. The empirical results

Our empirical presentation is not appearing by monetary school of thought but by "effect". In other words, initially the "money multiplier effects" are presented (Table 1a-1e) and then the "money-output" effects. Moreover, the first part of each table presents the likelihood ratios results [*Johansen's cointegration tests*]. The second part includes the implementation of the *EC.VAR* test in order to derive the direction of causality between the examined bivariate set of variables. It was applied when the existence of one cointegrating vectors (r=1) permitted it (assuming *deterministic trend* in the data).

(**see Table 1a-1f*)

Our discussion now will be reported by country. Starting from the *United States* results, it seems that they are close to the *Circuit Theory of Money* approach. More analytically, looking at the Table 1f, "*money-output effect*", and in particular the broad money (M2), we could comment that indeed output causes (or better precedes) money effect as well as bank credit causes (or precedes) output. They are however two weak points in the overall approach. First, that the error correction coefficients are not big enough and secondly that we cannot claim the same result regarding the GDP-M1 relationship ($\neq$)[54]. Concerning now the *money multiplier effects,* the lack of any long run causality is characteristic. There is however a "flavor" of money endogeneity, with Bank Credit (BC) causing both M1 and M2, but outside the typical Johansen's procedure (see Table 1a, footnote ρ).

In the same direction with the US is *Italy*. More analytically, on the issue of the "*money-output effect*" of Table 1f, it seems that the EC.VAR results favour the "output causes money effect" and the "bank credit causes output effect". So we can accept that Italy, on the issue of the "*money-output effect*" follows the ideas of the *Circuit Theory of Money.* On the issue of the *multiplier effects,* the only worth

[53] All tests results for the VAR's lag length selection of the causality tests have been produced with the help of EViews 4.1 and are available upon request.

[54] It is worth mentioning here that outside the Johansen's procedure we found (by applying an EC. VAR (5)) that GDP $\rightarrow$ M1.

reporting result is that "Mier2 causes bank credit" (a rather *New Keynesian* result). However, this outcome should be treated with caution for two reasons. First Normality as well as autocorrelation problems exist at the EC.VAR of this particular causality (see Table 1c). Secondly, and more crucial, is that the error correction term coefficient is relatively small (-0,01). This implies that the long run relationship between the two variables is very weak and possibly this is the reason which explain why the two *Johansen's cointegration tests [Trace and Max-Eigenvalue]* disagree about the number of co-integrating vectors at the first stage.

Turning now to the case of *UK* we can comment the following: Like in the case of US and Italy, the "output causes money effect" is verified by the UK data. But the second part of the effect, the "bank credit causes output", stays unverified (in fact unrelated). This looks like money endogeneity verification but halfway *Circutism*. On the other hand, the causality tests on the "money multiplier issue" verify the *Circuit Theory of Money* approach. In other words bank credit causes both Mier4 and M4. But the overall picture is partially spoiled by the empirical evidence that Monetary Base still affects M4 (see Table 1d). Someone could comment the overall picture by saying that in an economic environment were aggregate demand precedes money (which makes money looks endogenous), the Bank of England tries to play a role by insisting banks' liabilities control.

Regarding now *Germany* we could say that things are a bit more complicated. To be more specific, we could examine the narrow (m1) and broader (m2) monetary aggregates separately. In narrow terms, the only worth mentioning result is in Table 1a and states that money causes bank credit (a rather orthodox view). Taking also into account that money is not related to output we could partially infer that a "moderate" *New Keynesianism* is emerging from narrow money stock[55]. However, some drawbacks exist to accept this conclusion easily since no "credit channel" was revealed. Moreover Bank credit seems to Granger-cause Mier1 (see Table 1c) which is a non-orthodox result regarding the "multiplier effects". Turning now to the broader money stock (m2), the overall approach looks reversed (*Circutism* with *Orthodox*

[55] It is important to mention here that it is was our intesion to test any interest rate or spread explanatory power here because our overall analysis is quantitative one without any "pricing" intervention.

elements). More analytically, from Table 1f we observe that "output causes money effect" is verified but without any credit effect. However, bank credit seems to Granger-cause Mier2 and this is a pure *Circutistic* element in the multipliers' effects. The point of orthodox intervention we believe that it appears through the feedback relationship between bank credit and Monetary Base[56] (see Table 1e-a *Structuralism'*s element).

Turning now to *Canada* the only data that have some value to be commented are those related to narrow money (m1), since no long run relationship was traced with broader money (m2). Starting from the "money-output effect" we can say that a feedback relationship appears between the two variables. This by itself classifies Canada in the non-orthodox campus. But we cannot say in which sub-school is categorized since *Accommodatonism, Structuralism and Liquidity Preference* are claiming this (see Appendix 1). On the other hand, the results from the "multiplier effect" were not decisively helpful to categorize Canadian narrow money among the three schools. The only long run "multiplier effect" which was produced by the Canadian data was that Bank Credit causes Mier1 (see Table 1c). This however, although a pure non-orthodox result, was not helpful for clearing the short of endogeneity in Canadian's narrow money data[57].

We deliberately left for the end *Japan* and *France*. We did this because by the strict and severe econometric procedure we choose to work no long run relations[58] were produced for these two countries. However by looking again Appendix 1, the lack of causalities could be translated as pouring a moderate *New Keynesian* flavor to the monetary data of the two countries. Nevertheless a counter-argument exist here that there is no "credit channel" to verify a *New Keynesianism.* Such result could consequently lead us to supply-credit argument supported by a *New Keynesian* view that a "pricing" intervention, like interest rates an/or spreads, are the explanatory

[56] Although according to the error correction coefficient the Bank Credit effect on Monetary Base is much stronger than the reverse (0,22 and 0,05 respectively).
[57] Taking into account the BC ≠ MB result of Table 1e, we tend to sense a *Liquidity Preference* "flavour" on Canada's narrow money data.
[58] With the exception for France that MB⇒BC. This causality although not reported in the Appendix 1 could be considered as of an Orthodox orientation.

variables for explain output in *Japan* and *France*. In overall the issue of the two countries remains unsolved here[59].

Finally it worth reporting some more general observations produced by the empirical results. Looking carefully Table 1b (in overall) and 1c (causalities running from multiplier to bank credit) we can observe the termination of the *multiplier effect* in the G7 countries. The cause should be seek in the falling interest rates of the last two decades (see figure 1) in all countries as well as the gradual reduction of reserve requirements. Moreover, this falling interest rate dynamic evolution was positively affecting the valuation of the non-loan financial assets of the commercial banks (e.g. Securities, Government bonds, Derivatives, Mutual funds etc). So, banks as profit maximizers used any excess reserves derived from the relaxing monetary policy more for buying these assets than for extending their loans policy. This way they were in a position to record lots of profits at their income statement analysis, when capital gains from these financial activities will be liquidated. In other words, the profit maximizing ***asset*** function of commercial banks is such environment could be presented as :

$$\text{Max [w (loans) + (1-w) (non-loan financial assets)]}$$

with w : bank excess reserves.

Consequently (due to the falling interest rates), the prolonged deposit–loan relationship was broken (see Table 1a). This does not mean that the bank did not care about the expansion of their loans. It simply says that its importance varies (the w factor) with the financial environment and the evolution of interest rates in particular. In such "environment" commercial banks care more for speculative asset management and less for liabilities management. As long as the 1-w increases, this could lead to that even central bank loses its exogenous role, of safe-guarding money endogeneity, by allowing the abandonment of credit expansion for productive purposes in favour of destabilishing speculative purposes[60].

[59] Outside the Johansen's framework with the implementation of EC.VAR, we estimated that M2→Y in *France* and Y→M2 in *Japan*. But both the error correction coefficients we very small (e.g. -0,02) justifying this way the the Johansen's results.

[60] This argument comes from Dow (1989, p. 30) when he analysed the outside (exogenous) central bank role in the provision of credit for demand purposes. So an increasing of 1-w factor (at the expense of w) can consequently brake the effective link between the bank credit and output. This can be an explanation for tracing this link only in US and Italy. Similar result on the money-output link cannot be excluded.

6. Concluding comments

In this paper we presented the way the six different school of economic thought (two orthodox and four post-keynesians) are approaching the money-income relationship as well as the money multiplier model. Moreover we tested their views upon G7 economies with the implementation of advance econometric causality techniques (*Lutkepohl and Reimers (1992)* bivariate VAR causality approach). We can now summarize the main points of our research :

Most of the G7 economies -with the possible exemption of *France* and *Japan*- seems to follow a non-orthodox road regarding the money generation process. More specifically, the revolutionary reverse causation regarding the "money-output effect", advocated only by the *Circuit Theory of Money,* has found support in the broader monetary aggregates of *United States, Italy, UK, Germany* and to some extent *Canada* (although the result in *Canada* was a feedback but with stronger effect from output to money). On the other hand however, the "bank credit causes output" view was actually verified on *United States* and *Italy.* The lack of causality from bank credit to money output for the rest of the G7 countries was a bit odd since even the New Keynesians agree in its existence but they disagree on its cause (supply driven, see Appendix 1). Howells (1999) has given an explanation to this when he stated that the demand for bank credit is rather related to total transactions than to GDP[61]. In other words, although not unrelated to GDP it has broader relationships with the existing economic activity.

Linked with the previous last comment of the role of credit and the commercial banks is the issue of the "money multiplier effects". More specifically, from the general empirical picture it seems that with some sporadic exemptions the "money multiplier effects" or are not operative in the G7 economies, due to the prolonged falling interest rates on behalf of central banks (with a small exemption in late 1980's to early 1990's - see figure 1). More analytically, it seems that the economized excess reserves has turned the agents and commercial banks attention primarily on non-loan asset management policies with inevitable breaking consequences for the long run loan-deposit relationships. In other words, the liability

[61] Unfortunately such data are not available for G7 countries.

management policies of the last two decades, was not so much related with economizing reserves for extending loans but with investing them to other asset management policies (that is why no BC⇔Mier relationship was traced). The reason is simple: any prolonged falling interest rates are simply lead to falling profit from loans but simultaneously lead to substantially higher valuation of other financial assets and therefore much bigger profits for the banks (due their denominating role in the financial assets valuation). The resume is that for the examined period it looks that commercial banks cared more for the non-loan asset management and less about liability management and loans expansion. This does not mean that the do not care about the credit channel. Its only says that prolonged falling interest rates leads to changing priorities for commercial banks as profit maximizers.

This last comment we believe that opens the way for future research basically upon bank credit's origins and aim. In simple words, is it supply driven or demand driven? Is it for production purposes or for speculation and "round tripping"? To answer this a decomposition of credit is required on its supply and the demand factors (similar for instance to Panagopoulos and Spiliotis, 1998, equation 3, p. 648). Such an approach can possibly clarify the role and origins of the credit channel. In addition will helps us to see, from a decomposing perspective, whether money is Post- or New- Keynesian.

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Table 1a

Testing "The multiplier effect " : M.A.'s vs B.C**.**

Hypothesis: Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags* *(lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
BC on M1	10,80	11,88	0	6	BC ≠ M1
BC on M2	13,24	13,29	0	3	BC ≠ M2
France *(1980-2003)*					
BC on M1	17,27	21,40	1or2 [μ]	2	BC ≠ M1
BC on M2	11,95	16,11	0	4	BC≠ M2
Germany *(1980-1998)*					
BC on M1	15,27	16,15	1	6	
BC on M2	11,82	12,45	0	6	BC≠ M2
Italy *(1980-1998)*					
BC on M2	9,66	15,20	0	5	BC≠ M2
Japan *(1980-2003)*					
BC on M1	7,53	9,68	0	5	BC ≠ M1
BC on M2	5,47	5,47	0	5	BC≠ M2
UK. *(1980-2003)*					
BC on M4	54,46	60,46	1 or 2[μ1]	1	
USA *(1980-2002)*					
BC on M1	7,82	8,88	0	3	BC ≠ M1[ρ]
BC on M2	18,30	18,93	0	6	BC≠ M2 [ρ]

Table 1a (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
-	-	-	-
France			
-	-	-	-
Germany			
ΔBC, expl.$^{\upsilon}$ ΔM1	-3,64 (-0,11)$^{\oplus}$	6	
ΔM1 , expl. ΔBC	0,08	6	M1 $\Rightarrow$ BC
Italy			
-	-	-	-
Japan			
-	-	-	-
UK.			
ΔBC, expl. ΔM4	-3,92 (-0,009)	1	
ΔM4, expl. ΔBC	-4,92 (-0,26)	1	M4 $\Leftarrow$ BC
USA $^{\rho}$			
-	-	-	-

General Note: Dummies have been used for eliminating outliers which affect Normality's result when that was necessary.

ρ. It is important to mention here that neglecting the Johansen's results and moving to the EC.VAR's implementation, we observed (through the EC coefficients of the EC.VAR's) that Bank Credit causes both Monetary Aggregates (BC $\rightarrow$ M1 and M2).

μ. The Johansen's Co-integration tests provide different number of cointegrated vectors at 1% and 5% level (e.g. 2 at 5% and 1 at 1%). At 1% with r=1 the EC.VAR test results is that M1 $\rightarrow$ BC.

μ1. The Johansen's Co-integration tests provide different number of cointegrated vectors at 1% and 5% level (e.g. 2 at 5% and 1 at 1%). So we proceed to the second stage of our approach (the EC.VAR test).

⊕. The parenthesis nearby the t-ratio is the γ-coefficient of the the EC.VAR test.

υ. *expl.* stands for explanatory variable.

Table 1b

Testing "The multiplier effect ": *M.A.'s vs Mier's*

Hypothesis: Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags* *(lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
Mier1 on M1	14,19	14,37	0	5	Mier1 ≠ $M1^{\propto}$
Mier2 on M2	7,00	7,89	0	5	Mier2 ≠ $M2^{\propto}$
France *(1980-2003)*					
Mier1 on M1	11,14	14,90	0	2	Mier1 ≠ M1
Mier2 on M2	13,24	15,04	0	2	Mier2 ≠ M2
Germany *(1980-1998)*					
Mier1 on M1	10,20	10,84	0	2	Mier1 ≠ M1
Mier2 on M2	11,01	12,75	0	2	Mier2 ≠ M2
Italy *(1980-2003)*					
Mier2 on M2	7,74	9,03	0	5	Mier2 ≠ $M2^{\propto}$
Japan *(1980-2003)*					
Mier1 on M1	7,16	11,77	0	5	Mier1 ≠ M1
Mier2 on M2	5,73	7,30		5	Mier2 ≠ $M2^{\propto}$
UK. *(1980-2003)*					
Mier4 on M4	31,52	34,17	1	6	Mier4 ≠ M4
USA *(1980-2002)*					
Mier1 on M1	8,17	8,52	0	9	Mier1 ≠ M1
Mier2 on M2	19,50	19,51	1	8	

Table 1b (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
-	-	-	-
France			
-	-	-	-
Germany			
-	-	-	-
Italy			
-	-	-	-
Japan			
-	-	-	-
UK.			
-	-	-	-
USA			
ΔMIER2, expl. ΔM2	-3,19 (-0,09)	6	
ΔM2, expl. ΔMIER2	-3,02 (-0,02)	6	M2 ⇔ Mier2

∝ Some problems of Normality at 5%.

Table 1c

Testing "The multiplier effect ": *B.C. vs Mier's*

Hypothesis: Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags* *(lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
Mier1 on BC	15,10	16,18	1	6	
Mier2 on BC	7,34	7,36	0	6	Mier2 ≠ BC
France *(1980-2003)*					
Mier1 on BC	18,02	24,28	2	2	Mier1 ≠ BC
Mier2 on BC	17,47	23,60	2	2	Mier2 ≠ BC
Germany *(1980-1998)*					
Mier1 on BC	17,55	19,58	1	6	
Mier2 on BC	33,51	35,10	1	6	
Italy *(1980-1998)*					
Mier2 on BC	14,73	15,25	1or 0^{τ}	5	
Japan *(1980-2003)*					
Mier1 on BC	6,73	9,38	0	5	Mier1 ≠ BC
Mier2 on BC	8,27	9,19	0	5	Mier2 ≠ BC
UK. *(1980-2003)*					
Mier4 on BC	55,49	61,77	1or 2^{μ}	1	
USA *(1980-2002)*					
Mier1 on BC	6,40	8,49	0	5	Mier1 ≠ BC
Mier2 on BC	7,39	8,02	0	5	Mier2 ≠ BC

Table 1c (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
ΔMIER1 , expl. ΔBC	-3,61 (-0,13)	6	
ΔBC, expl. ΔMIER1	0,20	6	BC ⇒ Mier1
France			
-	-	-	-
Germany			
ΔMIER1 , expl. ΔBC	-3,81 (-0,63)	6	
ΔBC, expl. ΔMIER1	-0,02	6	BC ⇒ Mier1$^{\exists}$
ΔMIER2 , expl. ΔBC	-4,87 (-0,50)	6	
ΔBC, expl. ΔMIER2	-1,10	6	BC ⇒ Mier2$^{\exists}$
Italy			
ΔMIER2 , expl. ΔBC	2,18	2	
ΔBC, expl. ΔMIER2	-2,73 (-0,01)	2	BC ⇐ Mier2$^{\forall}$
Japan			
-	-	-	-
UK.			
ΔMIER4 , expl. ΔBC	-5,20 (-0,28)	1	
ΔBC, expl. ΔMIER4	-3,80 (-0,01)	1	BC ⇒ Mier4^{f}
USA			
-	-	-	-

∝. Some problems of Normality at 5%.

τ.The two Johansen's tests agree upon the number of cointegrated vectors at 1% (r=0) but they disagree upon the number of cointegrated vectors at 5% (1 or 0). We choose to accept the r=1 case and to "solve the difference" at the ECVAR level.

μ. The Johansen's Co-integration tests provide different number of cointegrated vectors at 1% and 5% level (e.g. 2 at 5% and 1 at 1%).

∃. X^2 (1) Autocorrelation problem at 5%.

f. Although it looks like feedback,the coeffecients'results conviced us that it is rather a unidirectional causality (BC→ Mier4)

∀. Some problems as well as X^2 (2) Autocorrelation problem at 5%.

Table 1d
Testing "The multiplier effect ": M.A.'s vs M.B.

Hypothesis : Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags* *(lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
M.B. on M1	19,55	20,45	1	5	
M.B. on M2	7,00	7,89	0	5	M.B.≠ M2
France *(1980-2003)*					
M.B. on M1	11,14	14,90	0	5	M.B. ≠ M1
M.B. on M2	13,24	15,04	0	2	M.B. ≠ M2
Germany *(1980-1998)*					
M.B. on M1	10,20	10,84	0	2	M.B. ≠ M1
M.B. on M2	11,01	12,75	0	2	M.B.≠ M2
Italy *(1980-1998)*					
M.B. on M2	10,51	18,13	0	5	M.B.≠ M2
Japan *(1980-2003)*					
M.B. on M1	7,16	11,77	0	5	M.B. ≠ M1
M.B. on M2	6,64	7,52	0	5	M.B.≠ M2$^{\propto}$
UK. *(1980-2003)*					
M.B. on M4	31,55	33,46	1	6	
USA *(1980-2002)*					
M.B. on M1	5,23	5,63	0	5	M.B. ≠ M1
M.B. on M2	5,84	6,00	0	5	M.B.≠ M2

Table 1d (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
ΔMB, expl. ΔM1	-3,44 (-0,13)	5	
ΔM1 , expl. ΔMB	-1,94	5	M1 ⇒ MB
France			
-	-	-	-
Germany			
-	-	-	-
Italy			
-	-	-	-
Japan			
-	-	-	-
UK.			
ΔMB, expl. ΔM4	-0,47	6	
ΔM4 , expl. ΔMB	-5,55 (-0,39)	6	MB ⇒M4
USA			
-	-	-	-

∝ Some problems of Normality at 5%.

Table 1e
Testing "The multiplier effect ": B.C. vs M.B.

Hypothesis: Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags* *(lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
M.B. on BC	2,79	3,30	0	6	M.B. ≠ $BC^{\propto}$
France *(1980-2003)*					
M.B. on BC	28,06	31,08	1	2	
Germany *(1980-1998)*					
M.B. on BC	17,38	17,42	1	6	
Italy *(1980-1998)*					
M.B. on BC	9,35	9,47	0	6	M.B.≠ BC^{Ψ}
Japan *(1980-2003)*					
M.B. on BC	8,73	9,37	0	5	M.B.≠$BC^{\propto}$
UK. *(1980-2003)*					
M.B. on BC	11,12	13,96	0	5	M.B.≠ $BC^{\propto}$
USA *(1980-2002)*					
M.B. on BC	5,58	5,76	0	5	M.B. ≠ BC

Table 1e (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
-	-	-	-
France			
ΔBC, expl. ΔMB	-5,46 (-0,02)	2	
ΔMB, expl. ΔBC	0,42	2	BC ⇐ MB
Germany			
ΔBC, expl. ΔMB	-3,69 (-0,05)	6	
ΔMB, expl. ΔBC	-2,31 (-0,22)	6	BC ⇔ MB
Italy			
-	-	-	-
Japan			
-	-	-	-
UK.			
-	-	-	-
USA			
-	-	-	-

∝ Some problems of Normality at 5%.

Ψ. The causality has been also tested up to 2003 were also no co-integration was traced among the two variables.

Table 1f

Testing "The money -output effects": GDP vs M.A.'s and B.C.

Hypothesis : Johansen's Co-integration tests	**λ Max-eigenvalue**	**λ trace**	**Numb. of *C.E.(s)***	**No. of *lags (lag selection- k)***	***long-run effect***
Canada *(1980-2003)*					
M1 on GDP	14,20	16,19	1	5	
M2 on GDP	6,90	7,88	0	2	M2 ≠ GDP$^{\propto}$
and					
BC on GDP	6,43	8,92	0	6	BC ≠ GDP
France *(1980-2003)*					
M1 on GDP	13,30	16,63	0	2	M1 ≠ GDP
M2 on GDP	13,74	17,96	0	2	M2 ≠ GDP
and					
BC on GDP	10,01	11,25	0	5	BC ≠ GDP
Germany *(1980-1998)*					
M1 on GDP	10,29	11,28	0	5	M1 ≠ GDP
M2 on GDP	13,60	15,70	1$^{\varphi}$	6	
and					
BC on GDP	4,18	6,43	0	5	BC ≠ GDP
Italy *(1980-1998)*					
M2 on GDP	17,53	24,10	1or 2$^{\partial}$	5	
and					
BC on GDP	15,55	21,03	1or 2$^{\partial}$	5	
Japan *(1980-2003)*					
M1 on GDP	12,32	12,75	0	4	M1 ≠ GDP
M2 on GDP	6,57	6,58	0	5	M2 ≠ GDP
and					
BC on GDP	7,01	7,71	0	5	BC ≠ GDP
UK. *(1980-2003)*					
M4 on GDP	36,10	39,63	1	5	
and					
BC on GDP	6,68	8,78	0	5	BC ≠ GDP$^{\propto}$
USA *(1980-2002)*					
M1 on GDP	12,16	12,94	0$^{\omega}$	5	M1 ≠ GDP
M2 on GDP	14,11	14,12	1$^{\tau}$	6	
and					
BC on GDP	19,56	19,65	1	6	

Table 1f (*continued*)

The EC.VAR tests	the error-correction term (*t-statistic*)	κ *(lag selection)*	the *long run* causality result
Canada			
ΔGDP, expl. ΔM1	-2,78 (-0,06)	5	
ΔM1, expl. ΔGDP	-2,15 (-0,23)	5	GDP ⇔ M1
France			
-	-	-	-
Germany			
ΔGDP, expl. ΔM2	-1,54	2	
ΔM2, expl. ΔGDP	-3,06 (-0,13)	2	GDP ⇒ M2♣
Italy			
ΔGDP, expl. ΔM2	1,97	5	
ΔM2, expl. ΔGDP	-3,30 (-0,11)	5	GDP ⇒ M2
and			
ΔBC, expl. ΔGDP	-0,45	5	
ΔGDP, expl. ΔBC	-3,71 (-0,02)	5	BC ⇒ GDP
Japan			
-	-	-	-
UK.			
ΔGDP, expl. ΔM4	0,60	5	
ΔM4, expl. ΔGDP	-5,71 (-0,52)	5	GDP ⇒ M4
USA			
ΔGDP, expl. ΔM2	1,42	6	
ΔM2, expl. ΔGDP	-2,67 (-0,09)	6	GDP ⇒ M2
and			
ΔBC, expl. ΔGDP	1,82	5	
ΔGDP, expl. ΔBC	-2,79 (-0,05)	5	BC ⇒ GDP

∝. Some problems of Normality at 5%.

∂. The Johansen's Co-integration tests provide different number of cointegrated vectors at 1% and 5% level (e.g. r=1at 1% and r=2 at 1%). We choose to to "solve the difference" at the ECVAR level.

Φ. The two Johansen tests disagree upon the number of cointegrated vectors at 5% (r=1 or r=0). We choose to accept the 1 vector and to "solve the difference" at the ECVAR level.

Ω. Outside the Johansen procedure we can report that we found that for an EC. VAR (5): GDP → M1.

♣.Note that in a simple ECVAR form –outside the Johansen procedure- we traced that GDP→M1 as well.

τ. The two Johansen's tests disagree upon the number of cointegrated vectors at 5% (1 or 0). We choose to accept the r= 1 case and to "solve the difference" at the ECVAR level.

APPENDIX 1

Hypotheses testing for the nature of money

Money theories (**School of thought**)	"**Multiplier effect**"	**"Money - Output effect"** (***nominal output***)
Accommodationalism	BC⇒ MB[¶] &	GDP ⇔ M.A.
-Horizontialism	BC ≠ MIER	
Structuralism	BC ⇔ MB[ℜ] &	GDP ⇔ M.A.
	BC⇔ MIER	
Liquidity Preference	MIER⇔ BC &	GDP ⇔ M.A.
	BC ⇔ M.A. [optional $BC \neq MB$]	
Circuist theory of money	BC ⇒ M.A. &	BC^d ⇒ GDP &
	BC ⇒ MIER	GDP ⇒ M.A.
Monetarism	MB ⇒ M.A., M.A. ⇒ BC	M.A. ⇒ GDP
	& MIER⇒ M.A.	[plus M.A.≠ RGDP]
New Keynesianism (*)	MIER⇒ BC &	BC^s ⇒ GDP (*credit channel*)
(**hard-liners*)	[$MB \Rightarrow M.A.$]	M.A.⇒ GDP (*money channel*)
New Keynesianism (•)	MIER⇒ BC &	BC^s ⇒ GDP (*credit channel*)
(• *moderates*)	[$MB \neq M.A.$]	M.A. ≠ GDP (*money channel*)

¶ because : BC⇒ MA ⇒ MB (endogeneity effect)

ℜ because : BC⇒ MA ⇒ MB (endogeneity effect) and BC⇐ MA ⇐ MB (non accommodative active *quantitative* Central Bank effect or "exogeneity effect").

BC : stands for total bank credit, BC^d and BC^s : demand and supply driven respectively, MB : stands for monetary basis, M.A.: stands for alternatively M1, M2 & M3, MIER : stands for money multiplier, GDP : stands for Gross Domestic Product.

APPENDIX 2

The *Lutkepohl and Reimers* Bivariate VAR approach

The Lutkepohl and Reimers (1992) methodological approach of causality follows the principles of co-integration in bivariate VAR systems, in a step by step basis. In the first step, we reparametrize two bivariate vector autoreggresive processes of order p [VAR (p)] to get the corresponding Johansen's (1988) error-correction (EC) forms. Then, with the help of the Johansen tests, the number of the existing co-integrating vectors (e.g. r = 0, 1, 2) will be defined. Moreover, the number of the existing co-integrating vectors will also transform our initial bivariate error-correction systems accordingly. To these reparametrized and transformed Granger - causality bivariate VAR systems, *long run* as well as *short run* tests will be implemented in order to define the direction of possible causality[62].

The Bivariate VAR System

According to the Lutkepohl and Reimers (1992) theoretical presentation, we assume the existence of the following bivariate vector autoreggresive process of order p [VAR(p)] [63] :

$$\begin{bmatrix} Z_t \\ X_t \end{bmatrix} = \sum_{i=1}^{p} \begin{bmatrix} \alpha_{11,i} & \alpha_{12,i} \\ \alpha_{21,i} & \alpha_{22,i} \end{bmatrix} \begin{bmatrix} Z_{t-i} \\ X_{t-i} \end{bmatrix} + u_t \qquad (1)$$

where Z_t and X_t are the two time series variables and $u_t = (u_{1t}, u_{2t})'$ is the bivariate white noise process with zero mean and nonsingular covariance matrix $\sum_u$.

Reparametrasing (1), by subtracting $(Z_{t-1}, X_{t-1})'$ from both sides of the system and by rearranging the variables , we can get the Johansen's (1988) error-correction (EC) form of the process :

[62] It is importance to underline that we are only consider VAR processes as a good approximation of the unknown process. In other words, if the true process has a VARMA presentation then the whole analysis is under question.

[63] The optimal P is selected with the help of the 5 different lag selection criteria we mentioned in

$$\begin{bmatrix}\Delta Z_t \\ \Delta X_t\end{bmatrix} = \sum_{i=1}^{p-1} \Gamma_i \begin{bmatrix}\Delta Z_{t-i} \\ \Delta X_{t-i}\end{bmatrix} - \Pi \begin{bmatrix}Z_{t-p} \\ X_{t-p}\end{bmatrix} + u_t \qquad (2)$$

where

$$\Gamma_i = -(I_k - A_1 - A_2 - ..... A_i), \; i = 1, ..., p-1$$

and $$\Pi = I_k - A_1 - A_2 - ..... A_p$$

Here $$A_i = \begin{bmatrix}\alpha_{11,i} & \alpha_{12,i} \\ \alpha_{21,i} & \alpha_{22,I}\end{bmatrix} \quad i = 1, ..., p.$$

The rank of the matrix Π, say r, will transform process (2) accordingly. More analytically, as Lutkepohl and Reimers (1992) say, *" for r = 1 the two variables Z_t , X_t are co-integrated in the sense of Engle and Granger (1987)*[64] *. If r = 0 then Π = 0 and the system is stationary in first differences. At the other extreme end, if r = 2, Π is nonsingular and the system is stationary in levels (without taking differences)".*

The two likelihood ratio tests (the Trace and Maximal Eigenvalue tests), from the Johansen's (1988) methodology, can be implemented next for defining the co-integrated rank of the matrix Π of process (2) and therefore the nature of our causality tests. Then long run (as well as any short run tests) will be implemented in order to define the direction of possible causality. The long run test is basically related to the Jenkinson (1986) methodology, where the direction of the long-run causality among two variables will be basically revealed from their long run relationship incorporated as an explanatory variable – defined as E.C.T. in ECM/Causality model 3 [65]. In other words, the statistical significance of this term/variable (γ-coefficient) will show us the direction of the long-run causality.

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footpath 47.

[64] In other words, when r = 1 the corresponding Granger - causality bivariate error-correction tests will have an error-correction term (as Π ≠ 0 and singular) and the causality bivariate error-correction tests will follow the classical Granger and Engle (1987) two - step procedure.

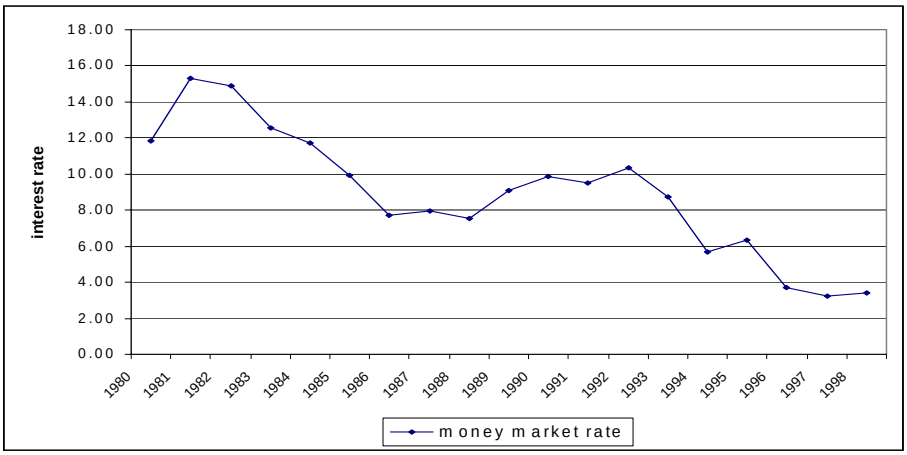
[65] The ECM/Causality model applied here will have the following structure :

$$\Delta y_t = const. + \sum_{i=1}^{n} \alpha \Delta y_{t-1} + \sum_{j=1}^{n} \beta \Delta x_{t-1} - \gamma \, ECT_{-1} + e_t \qquad (3)$$

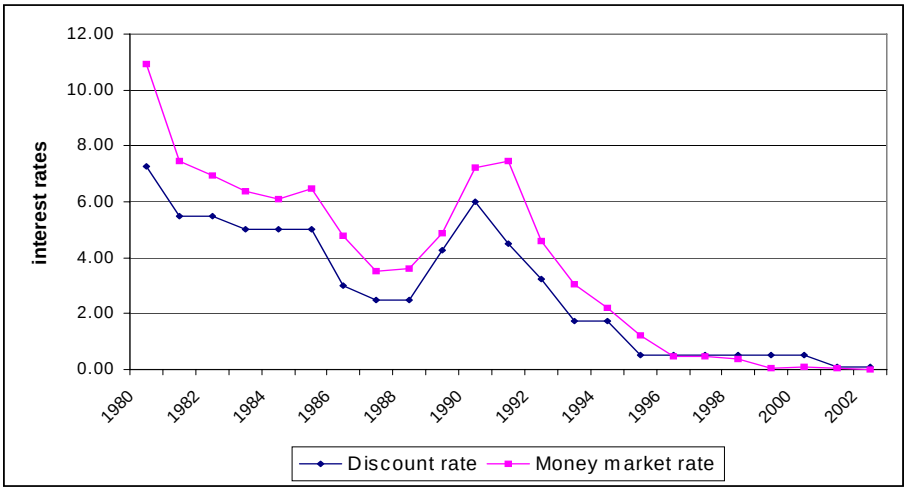
In all examined cases the Sims' test for the optimal lag length selection, has been implemented.

FIGURE 1

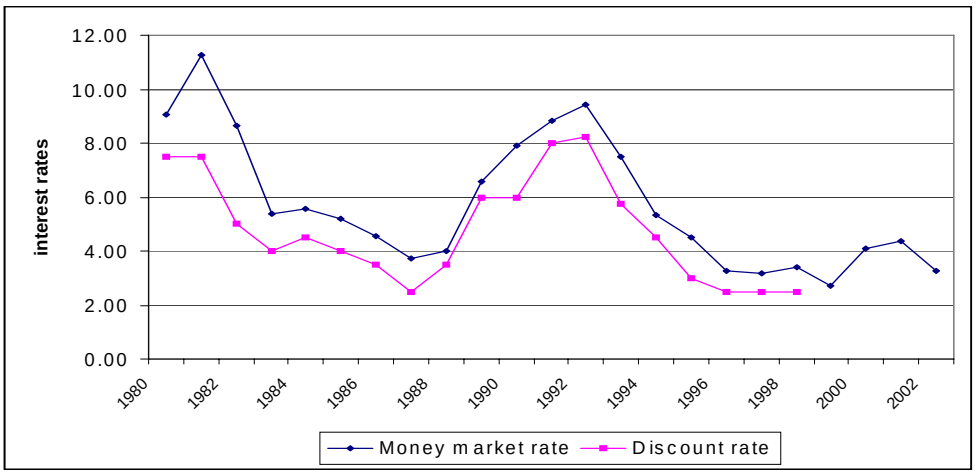
France



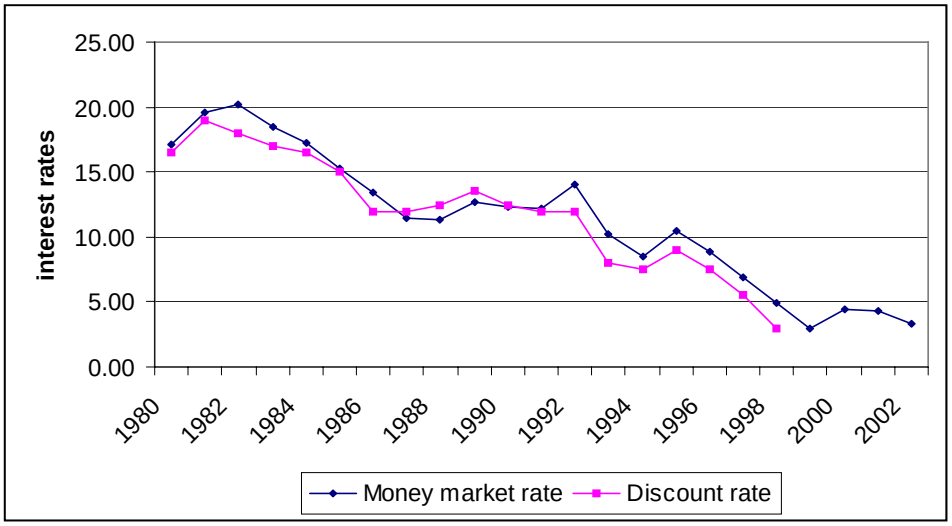
Japan



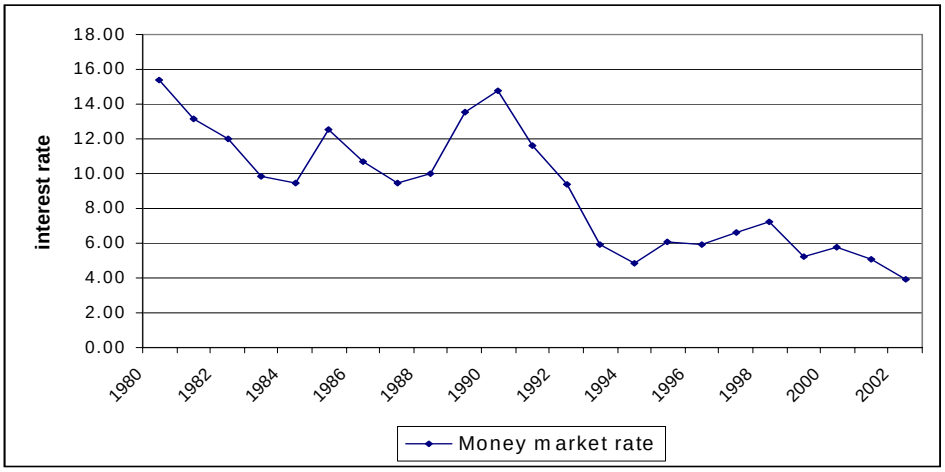
Germany



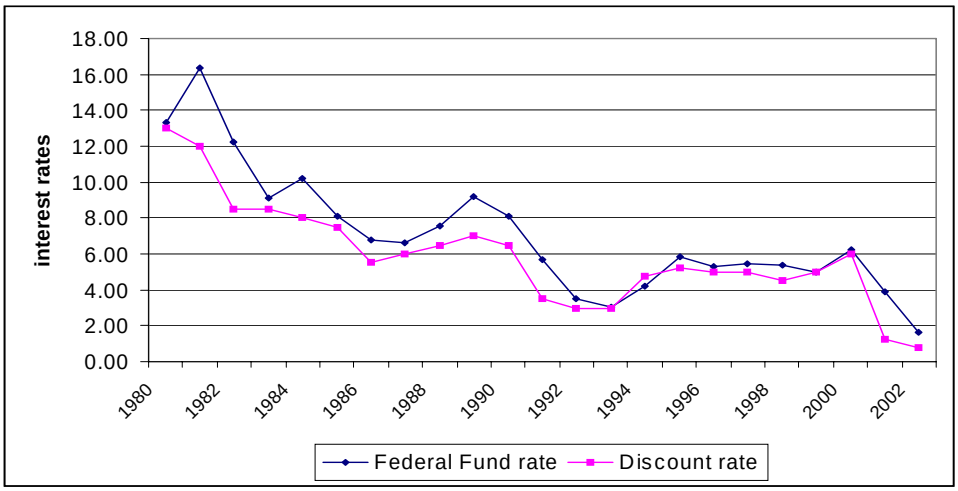
Italy



United Kingdom



USA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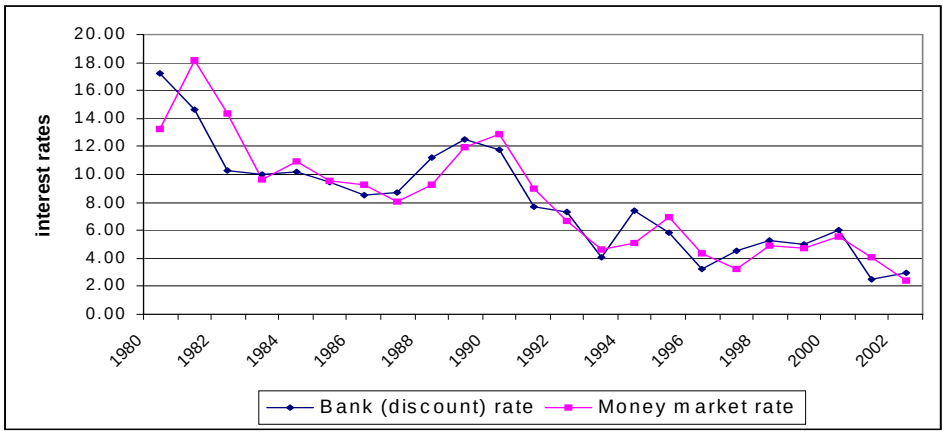
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2000
2002
Bank (discount) rate
Money market rate

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